

37 Vietnam



37.1 Summary of Coal Industry

37.1.1 ROLE OF COAL IN VIETNAM

Coal accounted for 21 percent of Vietnam's electricity generation in 2011 (IEA, 2014). Although Vietnam has historically relied on hydropower for electricity, coal-fired power plants are expected to account for 48 percent of Vietnam's total electricity production by 2020 (Mayer Brown JSM, 2011). Vietnam suffered a shortage of electricity of 8–10 Terawatt-hours in 2008-09. By 2020, the shortage could be 115 – 225 Terawatt-hours as energy demand is growing up to 14 percent per year (Baruya, 2010; Economist, 2013).

The country's coal reserves, as shown in Table 37-1, are estimated at 150 million tonnes (Mmt), with almost all of the reserves as anthracite. Since the 1980s, Vietnam has become a major player in coal production in Southeast Asia. Production reached a peak of 44.7 Mmt in 2010 and declined slightly to 41.8 Mmt in 2012 (EIA, 2014). Vietnam's *Master Plan on Coal Sector Development to 2020 with Vision to 2030* projects annual coal output to reach 55 Mmt by 2015 (Le, 2013).

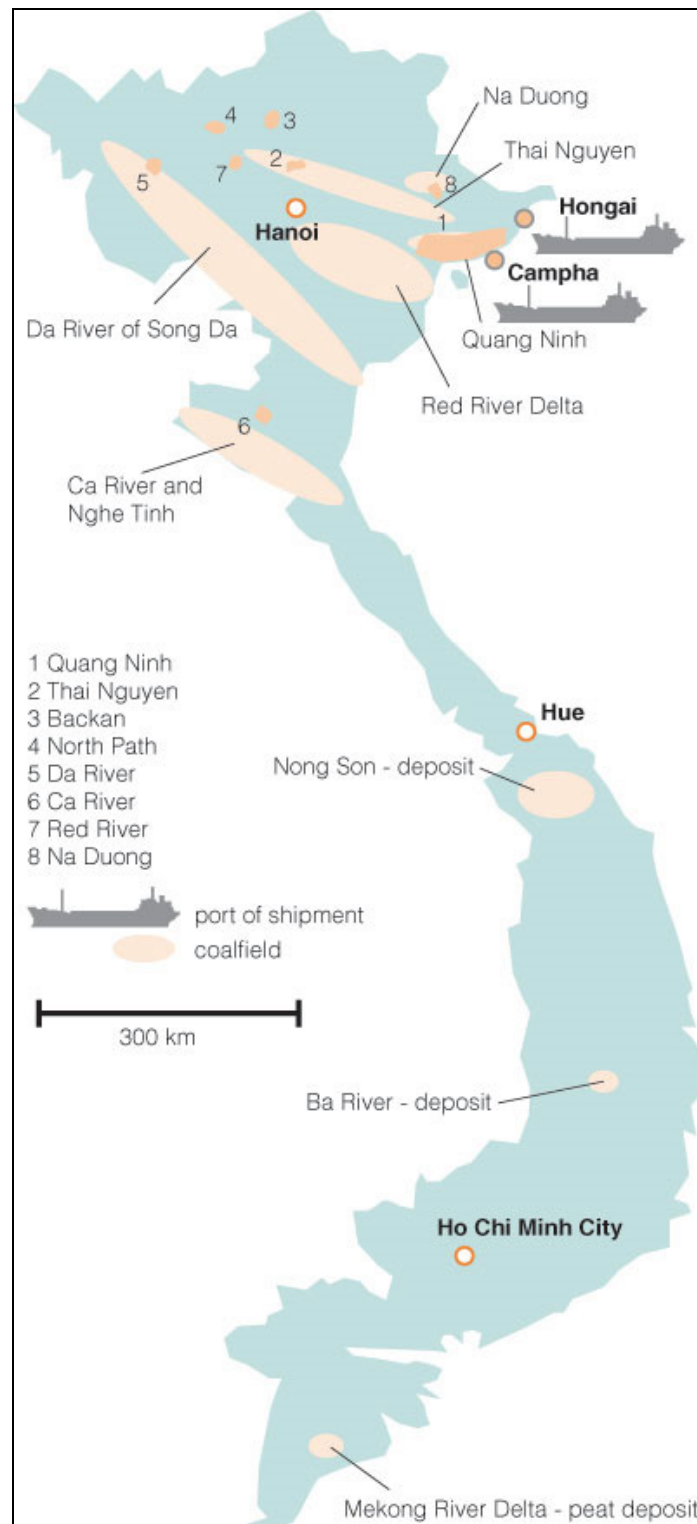
Table 37-1. Vietnam's Coal Reserves and Production

Indicator	Anthracite & Bituminous (million tonnes)	Sub-bituminous & Lignite (million tonnes)	Total (million tonnes)	Global Rank (# and %)
Estimated Proved Coal Reserves (2011)	150	0	150	54 (0.02%)
Annual Coal Production (2012)	42.1	0	42.1	17 (0.53%)

Source: EIA (2014)

Most of Vietnam's coal resources are located in the north. The Quang Yen anthracite region basin, east of Hanoi near the Red River Delta, is the central mining area where coal deposits cover a total area of 3,500 square kilometers (km²). These deposits are estimated to be 190-272 billion tonnes, lying 250-1,200 meters beneath the basin. The dip makes about half of it suitable for surface mining while the other half must be deep mined (Omdahl et. al., 2009). In 2013, Vietnam's Prime Minister approved a plan for a pilot project to test and evaluate technologies for underground coal mining and gasification in the Red River coal basin. The pilot project is expected to be completed by 2020 (Vinacomin, 2013). Figure 37-1 below shows Vietnam's coal resources.

Figure 37-1. Vietnam's Coal Resources



Source: Baruya (2010)

37.1.2 STAKEHOLDERS

Vietnam's coal mining industry is owned and operated by the state coal mining company, Vinacomin (Vietnam National Coal and Mineral Industries Group), which was created by the merger of the Vietnam Coal Corporation (Vinacoal) and Vietnam Minerals Corporation. Vinacomin operates 95 percent of all coal mines (Le, 2012).

Table 37-2. Key Stakeholders in Vietnam's CMM Industry

Stakeholder Category	Stakeholder	Role
Mining Companies	▪ Vinacomin	Project hosts
Equipment Manufacturers	▪ Vietnam Research Institute of Electronics, Informatics and Automation	
Universities, Research Establishments	▪ Institute of Mining Science and Technology, Hanoi, Vietnam ▪ University of Mining and Geology, Hanoi, Vietnam	Technical assistance
Regulatory Agencies and Government Groups	▪ Vinacomin ▪ PetroVietnam ▪ PetroVietnam Exploration Production Corporation	Project identification and assessment support

37.1.3 STATUS OF COAL AND THE COAL MINING INDUSTRY

As of 2010, Vietnam had 30 underground mines, five of which have an annual production capacity of more than 2 Mmt and nine of which have production more than 1 Mmt (Trần, 2010). Vietnam is seeking to increase production of its deeper anthracite reserves for high-quality export grade coals, as well as for its expanding coal power sector. Purchases of heavy mining equipment from Australia have enabled the expansion of existing underground mines and development of new underground mines.

Vietnam now has 24 open surface mines. Five of these mines have an annual production capacity of more than 2 Mmt each. There are 15 surface mines with annual production capacity between 100 and 700 thousand tonnes. Production from surface mines accounts for 55 to 60 percent of coal produced in Vietnam (Trần, 2010).

Vietnam exported 17.8 Mmt of coal, primarily to China, Japan, and South Korea in 2012, a decrease from a peak of 31.3 Mmt in 2007 (EIA, 2014; Trần, 2010; Dao, 2014). Exports decreased further in 2013, falling to 12.8 Mmt. In recent years Vietnam has cut its annual export volumes of coal to fill growing demand from domestic coal-fired power plants (Dodson, 2014). Domestic coal demand increased from 18 Mmt in 2007 to 24.8 Mmt in 2012. Exports are projected to fall to 9 Mmt per year by 2015 (Le, 2013). Vietnam began importing coal to meet power plant demand in 2011, importing 9.5 thousand tonnes of bituminous coal from Indonesia annually (VPBS, 2013). Vietnam's state-owned oil and gas group, PetroVietnam, is reportedly planning to purchase 10 Mmt of coal per year from Australia and Indonesia beginning in 2017 to supply three new power plants. Vinacomin is also planning to increase imports, with purchases to be made from Australia and Russia (Ho, 2014).

As of 2013, Vietnam had 18 coal-fired power plants with a total capacity of 6,766 MW and 13 gas turbine plants with a total installed capacity of 7,285 MW. Coal-fired capacity is growing rapidly, with new plants such as Uong Bi 2, Nghi Son 1 (1st unit), Quang Ninh 2 and Hai Phong 2 commissioning in 2013. Vietnam's *National Plan for Power Development for the 2011-2020 Period with Vision to 2030* (Master Plan VII) approved 52 coal-fired power plant projects and as of 2013,

31 projects were in various stages of planning and construction (VPBS, 2013). To meet the demand outlined by Master Plan VII, Vietnam's annual coal demand will reach 62-72 Mmt by 2020, with demand for power totaling 42-72 Mmt and other industries consuming 20-22 Mmt (Le, 2013).

37.2 Overview of CMM Emissions and Development Potential

Vietnam has not hosted any coal mine methane (CMM) recovery and utilization projects; however, the coal bed methane (CBM) industry is emerging in areas where mining is poised to take place, and thus may evolve into CMM projects as CBM activity intersects with mining.

A recent study of Vietnam's 25 gassy hard coal mines was commissioned to determine gas content of coals and to forecast methane release into the mines. Seven mines were classified as especially gassy. The results of the forecasts and a study of the capacities of these mines' ventilation systems are being used to estimate the amount of methane that may be captured by drainage systems. Additionally, the gassiest mine, Mao Khe, was equipped with an automatic methane content measurement control system (Somers, 2010).

The Khe Cham coal mine in Quang Ninh Province implemented a drainage system in 2012, reducing the concentration of methane in ventilation air and improving mine productivity. The mine plans to use drained methane to produce electricity for onsite use at the mining complex which includes four underground mines. The proposed power generation project has the potential for reducing greenhouse gas emissions by more than 360 thousand tonnes of CO_{2e} annually (GMI, 2013).

37.2.1 CMM EMISSIONS FROM OPERATING MINES

With increasing coal production and the mining of deeper seams, CMM emissions in Vietnam have also increased. Table 37-3 summarizes Vietnam's CMM emissions.

Table 37-3. Vietnam's CMM Emissions (million cubic meters)

Emission Category	2000*	2005	2010	2015 (projected)
Total Emissions from Underground Coal Mines	129.8			
Total Emissions from Surface Mines	1.4			
Total Emitted	131.2	366.3	484.2	530.4

Source: USEPA (2012); *UNFCCC (2010)

37.2.2 CMM EMISSIONS FROM ABANDONED MINES

No information relating to recovery or use of CMM from abandoned mines is available.

37.2.3 CBM FROM VIRGIN COAL SEAMS

A number of potential areas for CBM development exist in Vietnam. The Red River Basin is an economically important area of northern Vietnam. The area has coal deposits lying at depths of 250

to 1,200 meters spread over a 3,500 square kilometer area. Gas content of the basin's sub-bituminous coal is estimated at 0.94 to 1.6 cubic meters (m³)/tonne (30 to 50 scf/ton), with conservative resource estimates ranging from 170 to 280 billion m³ (6 to 10 Tcf). Another area of interest is the Quang Yen Basin, which extends over 200 km from east to west in northeast Vietnam and covers approximately 5,000 km². Though yet undetermined, CBM and CMM potential of this area is a target for study (Thai, 2008).

Most of Vietnam's CBM activity to date has been confined to the Red River Basin. Keeper Resources worked on the first CBM exploration projects. A negotiated CBM concession with PetroVietnam and PetroVietnam Exploration Production Corporation (PVEP) covered approximately 3,600 km² of the Red River Basin to the southeast of Hanoi. Three years of negotiations were concluded with the signing of a CBM Production Sharing Contract (PSC) in early 2010. The project proceeded with the signing of drill site construction and preparation contracts after acquiring land access approvals (Dragon Capital, 2008; Dragon Capital, 2010). According to a company announcement, however, preliminary field desorption testing results determined that the coals were under-saturated with no significant quantities of methane reported and further test wells were cancelled. The PSC was relinquished in April of 2012 (VRI, 2011; Woodhouse, nd).

Arrow Energy signed a PSC with PVEP in a CBM concession block of 2,610 km² in the Red River Basin, referred to as the Hanoi Trough. Arrow, now Dart Energy Ltd., holds a 70 percent interest in the block with a subsidiary of PetroVietnam holding the remaining 30 percent. The block is in the vicinity of the Tien Hai-Thai Binh industrial area and approximately 150 km southeast of Hanoi. In 2009, Dart Energy completed Phase 1 of an initial eight-well exploration drilling campaign. Results from two wells indicated increasing gas volumes at depth. In 2010, Dart Energy commenced a second phase of exploration drilling, focusing on deepening a number of the earlier exploration wells, which indicated some potential for commercial CBM production, at depths greater than 1,000 meters. Dart Energy has been given approval for an extension of the PSC exploration period for the purpose of enabling further technical studies and pilot studies. The Hanoi Trough block currently has 22.7 billion m³ of gross original gas in place (OGIP) and 7.1 billion m³ of gross 2C resource⁶, as certified by Netherland, Sewell & Associates Inc. (Dart, 2013).

PetroVietnam developed a joint venture with Italian utility Eni SpA in early 2013 allowing Eni to enter into partnerships for CBM and shale oil exploration projects in Vietnam. Eni drilled an offshore exploration well in 2013 and studies are underway on CBM potential (Koh, 2013; Le, 2014).

37.3 Opportunities and Challenges to Greater CMM Recovery and Use

Vietnam is a signatory to both the UNFCCC and the Kyoto Protocol (see Table 37-4). As a Non-Annex I Party to the Kyoto Protocol, it has no national emissions targets and was eligible to host

⁶ Contingent resources are those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations, but the applied project(s) are not yet considered mature enough for commercial development due to one or more contingencies. Contingent resources are further categorized in accordance with the level of certainty associated with the estimates (low/best/high estimates are denoted as 1C/2C/3C, respectively) (PRMS, 2007).

mitigation projects under the Clean Development Mechanism (CDM). Vietnam hosted 251 registered CDM projects; however, none were CMM recovery and utilization projects (UNEP, 2014).

Table 37-4. Vietnam’s Climate Change Mitigation Commitment

Agreement	Signature	Ratification
UNFCCC	June 11, 1992	November 16, 1994
Kyoto Protocol	December 3, 1998	September 25, 2002

Source: UNFCCC (2014)

37.3.1 MARKET AND INFRASTRUCTURE FACTORS

Increased coal mining to meet electricity demand as well as increased demand for natural gas makes CBM and CMM attractive in Vietnam. Coal mining is poised to continue escalating in Vietnam to meet the demand of up to 72 Mmt by 2020 (Le, 2013). With electricity consumption growing by 12-16 percent annually through 2015 due to increased industrial and residential demand, power shortages are expected (USCS, 2013). The government strictly controls electricity retail prices which have been criticized as being too low to encourage investment in the power sector; however, in order to attract more investment from the private sector in developing Independent Power Producer (IPP) projects, Vietnam’s Ministry of Industry and Trade and EVN are formulating plans to increase prices. As of late 2013, the average price paid by retail customers was \$0.07 USD per kilowatt hour (kWh); however, the Prime Minister approved an increase to \$0.09 per kWh to be implemented by 2015 (USCS, 2013; Folkmanis, 2013).

Gas currently provides 30 percent of installed electric capacity in Vietnam (USCS, 2013). In 2012, 7.6 billion m³ of gas was used to generate 40.7 billion kWh of electricity. In 2013, 8.4 billion m³ of gas was consumed to generate 44.4 billion kWh, an almost 9 percent increase. The total gas consumption in Vietnam is forecast to reach 17 billion m³ in 2025, around 75 percent of which is expected to be used for power generation. Gas prices are increasing in Vietnam, rising from \$4.80 USD per million BTU (MMBtu) in 2011 to \$5.19 USD per MMBTU in March of 2013. As of late 2013, the forecasted natural gas price for March 2014 was \$5.61 USD per MMBTU (VPBS, 2013). Vietnam’s gas demand is expected to exceed domestic supply by 2015 (Folkmanis, 2013) and as such, additional gas-fired power plants are not currently planned. Vietnam is also limited in pipeline networks (Le, 2014).

37.3.2 REGULATORY INFORMATION

Vietnam’s natural gas sector is controlled by the state-owned PetroVietnam, which is under the control of the Ministry of Industry. CBM activity is conducted through PSCs and is treated legally as petroleum. CBM is part of the government’s Petroleum Development Planning; however, there are currently no specific targets for unconventional gas production (Le, 2014). The Vietnam Petroleum Institute cited a number of constraints to CBM production in Vietnam as of early 2014 including lack of incentives for unconventional gas production as well as a lengthy negotiation process for gas prices and a time-consuming process to acquire land (Le, 2014).

37.4 Profiles of Individual Mines

Profiles of individual mines in Vietnam are not available.

37.5 References

- Baruya (2010): Prospects for Coal in Vietnam. Paul Baruya, IEA Clean Coal Centre, CCC/164, ISBN 978-92-9029-484-9, February 2010. [http://www.iea-coal.org.uk/documents/82299/7465/Prospects-for-coal-and-clean-coal-technologies-in-Vietnam-\(CCC/164\)](http://www.iea-coal.org.uk/documents/82299/7465/Prospects-for-coal-and-clean-coal-technologies-in-Vietnam-(CCC/164))
- Dao (2014): Vietnam's Jan thermal coal exports fall 17% on year to 978,158 mt, Dao Dang Toan, Platts, 13 February 2014. <http://www.platts.com/latest-news/coal/hanoi/vietnams-jan-thermal-coal-exports-fall-17-on-27929618>
- Dart (2013): Block MVHN-01KT (Hanoi Trough), Dart Energy Ltd., 2013. http://www.dartgas.com/page/Worldwide/Vietnam/Block_MVHN-01KT
- Dodson (2014): Vietnamese state company plans to import coal from 2017, Sam Dodson, *World Coal*, 10 February 2014. http://www.worldcoal.com/news/power/articles/Vietnamese_coal_imports_set_to_rise_488.aspx#U2e1MPldXzg
- Dragon Capital (2008): Vietnam Resource Investments, Dragon Capital Markets Limited Monthly Report, March 2008. http://www.dragoncapital.com/UserFiles/File/monthly%20report/2008/Mar/MR_200803VRI.pdf?PHPSESSID=e1fc9daa1d3bfa3ae589ab41f43ad982
- Dragon Capital (2010): Vietnam January 2010 Update, Dragon Capital Markets Limited, January 2010. http://www.dragoncapital.com/UserFiles/File/monthly%20report/2010/Jan/MR_201001.pdf
- Economist (2013): A heavy load, *The Economist*, 31 August 2013. <http://www.economist.com/news/asia/21584374-vietnams-power-grid-under-strain-all-kinds-fuses-may-blow-heavy-load#>
- EIA (2014): International Energy Statistics, U.S. Energy Information Administration, Washington, DC, accessed April 2014. <http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm>
- Folkmanis (2013): Vietnam Faces Growing Threat of Power Blackouts: Southeast Asia, Jason Folkmanis, Bloomberg News, 5 December 2013. <http://www.bloomberg.com/news/2013-12-05/vietnam-faces-growing-threat-of-power-blackouts-southeast-asia.html>
- GMI (2013): Cross Measure Degasification Pilot Project at the Khe Cham 1 Underground Mine (Quang Ninh Province, Vietnam), presented at the Global Methane Initiative Methane Expo 2013, Vancouver, Canada, 12-15 March 2013. https://www.globalmethane.org/expo-docs/posters/CoalMines/CM_VT_Project_KheCham-from-RRR_FINAL.pdf
- Ho (2014): Petrovietnam to import coal from 2017 for power plants, Ho Binh Minh, Reuters, 10 February 2014. <http://uk.reuters.com/article/2014/02/10/vietnam-coal-import-idUKL3N0LF36Y20140210>
- IEA (2014): Vietnam: Electricity and Heat for 2011, International Energy Agency, Paris, France, 2014. <http://www.iea.org/statistics/statisticssearch/report/?country=VIETNAM&product=electricityandheat&year=2011>
- Koh (2013): Petrovietnam, Eni Pen Pact for Unconventional Energy Exploration, Quintella Koh, Rigzone, 1 March 2013. http://www.rigzone.com/news/oil_gas/a/124727/Petrovietnam_Eni_Pen_Pact_for_Unconventional_Energy_Exploration
- Le (2012): The Coal Import and Export Strategy of Vinacomin in the Coming Years, Le Minh Chuan with Vinacomin, presented at the Clean Coal Day International Conference, Tokyo, Japan, 5 September 2012. http://www.jcoal.or.jp/coaldb/shiryu/material/2012day2_session3_1.pdf
- Le (2013): Current Status of Coal Demand and Supply in Vietnam and Plan of Vinacomin in the Coming Time, Le Minh Chuan with Vinacomin, presented at the Clean Coal Day International Conference, Tokyo, Japan, September 2013. http://www.jcoal.or.jp/coaldb/shiryu/material/day2_session2_3.pdf

- Le (2014): Non-Geological Constraints to Shale Gas/Coal-Bed Methane Production in Vietnam, Le Ngoc Anh with Vietnam Petroleum Institute, presented at the Seminar on “Non-Geological Constraints to Unconventional Gas Production in East Asia: China, Indonesia and Vietnam,” Marina Mandarin, Singapore, 27 February 2014. <http://www.esi.nus.edu.sg/docs/default-source/event/140218-vpi-emc-unconventional-gas---presentation-in-singapore---final-version.pdf?sfvrsn=2>
- Mayer Brown JSM (2011): Vietnam Power Development Plan for the 2011-2020 Period, Mayer Brown JSM, 1 September 2011. <http://www.mayerbrown.com/files/Publication/7eb02f45-1783-4f14-8565-bf5120e1ea08/Presentation/PublicationAttachment/5dcbbea1-2d9f-42ae-8cbd-dab97456c4c5/11556.pdf>
- Omdahl et. al. (2009): *Vietnam's Coal, Mining, and Coal-fired Power Generation*, Brent Omdahl, Nguyen Dzung, and Jason Card, presented at the U.S. Embassy, Hanoi, Vietnam, 10 June 2009.
- PRMS (2007): Petroleum Resources Management System, Society of Petroleum Engineers, American Association of Petroleum Geologists, World Petroleum Council, and Society of Petroleum Evaluation Engineers, 2007. <http://www.spe.org/industry/docs/Petroleum Resources Management System 2007.pdf>
- Somers (2010): Coal Mine Methane Project Opportunities: Globally and in Vietnam, Jayne Somers and Charlee Boger, presented at Advanced Mining for Sustainable Development, Ha Long Bay, Viet Nam, September 2010.
- Thai (2008): Coal Bed Methane in Vietnam is Hot, Thai Son Do, Research Associate, Energy & Power Systems Practice, Frost & Sullivan, 7 August 2008. <http://www.frost.com/prod/servlet/market-insight-top.pag?docid=140182389>
- Trần (2010): Coal Export and the Future in Vietnam, Dr. Trần Xuân Hòa with Vinacomin, presented at the Clean Coal Day International Conference, Tokyo, Japan, 7 September 2010. http://www.jcoal.or.jp/coaldb/shiryu/material/Session1_5_TranXuanHoa.pdf
- UNEP (2014): CDM Pipeline Spreadsheet, United Nations Environment Programme Risoe Centre, 1 April 2014. <http://cdmpipeline.org/>
- UNFCCC (2010): Viet Nam's second national communication to the United Nations Framework Convention on Climate Change, 7 December 2010. <http://unfccc.int/resource/docs/natc/vnmnc02.pdf>
- UNFCCC (2014): Ratification Status – Vietnam, United Nations Framework Convention on Climate Change, website accessed September 2014. <http://maindb.unfccc.int/public/country.pl?country=VN>
- USCS (2013): Vietnam Market for Power Generation, Transmission and Distribution, U.S. Commercial Service, June 2013.
- USEPA (2012): *Global Anthropogenic Non-CO₂ Greenhouse Gas Emissions: 1990-2030*, U.S. Environmental Protection Agency, Office of Atmospheric Programs, Climate Change Division, December 2012. <http://www.epa.gov/climatechange/EPAactivities/economics/nonco2projections.html>
- Vinacomin (2013): Red River coal basin development project re-kicked off, Vinacomin, 19 August 2013. <http://www.vinacomin.vn/en/news/News-of-Vinacomin/Red-River-coal-basin-development-project-re-kicked-off-750.html>
- VPBS (2013): Vietnam Power Industry, Vietnam Prosperity Bank Securities, December 2013. <https://vpbs.com.vn/Handlers/DownloadReport.ashx?ReportID=1867>
- VRI (2011): Company Announcement: Vietnam Resource Investments (Holdings) Limited, Coal Bed Methane Project - Preliminary Drilling Results, 12 December 2011. http://www.dragoncapital.com/media/74683/vri_co%20announcement_kee%20drilling%20results_12122011.pdf
- Woodhouse (nd): David Woodhouse *LinkedIn* [Profile page], not dated, retrieved April 2014. <https://www.linkedin.com/pub/david-woodhouse/25/9a2/b76>